Public Acceptability of Recycled Water: Getting the Cognitive Sewage Out after the Physical Sewage is Gone

Carol Nemeroff, Ph.D.
University of Southern Maine, and Portable Ethics, Inc.
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People are not 100% "rational"

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Population growth
+
Climate Change
=
Water Shortage

The wars of the near future will be fought not over oil, but over water. Mark Lapping

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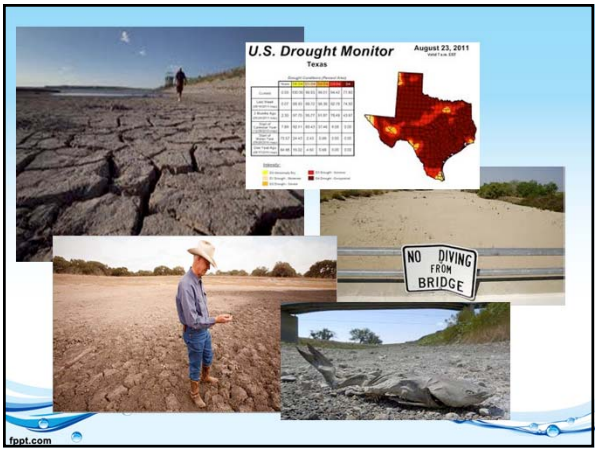

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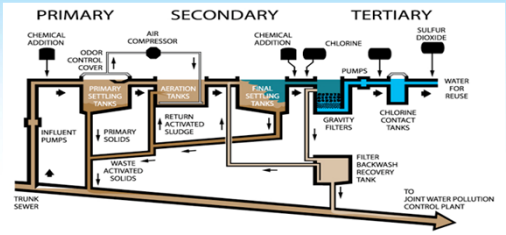
Water Reuse and Recycling (WRR)

3-phase processing system yields ultra-pure, good tasting water



From http://www.lacsd.org/about/wastewater_facilities/default.asp

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You want me to drink WHAT?

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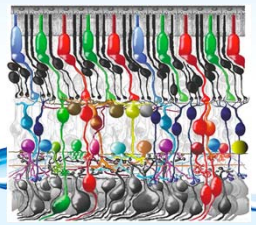
- **My research:** Non-rational processes that drive behavior
  - Cognitive psychology
  - Health psychology
  - Medical Anthropology
- Other relevant psychological concepts
  - Overview, recommendations, future studies?

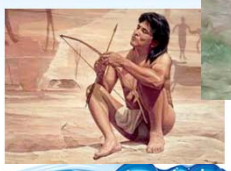
Key concept:

- Nisbett & Ross, Kahneman & Tversky (1980's): The Cognitive Heuristic

- **Visual system:**
  - hard-wired
  - constructs a coherent world out of the mess received by the retina (where visual receptor cells are)
  - Can generate occasional illusions



- **Cognitive system**:
  - Also hard-wired with "heuristics"
  - Time and effort-saving rules of thumb
  - Generally adaptive
  - Occasionally fooled



Paul Rozin – Disgust

- Disgust responses follow "Laws of Sympathetic Magic (Frazer, 1890/1950)
  - Law of Similarity
    - The image equals the object
  - Law of Contagion
    - Once in contact, always in contact
- Magical laws as universal principles of thinking (Frazer)
  - Similarity and Contagion *as Heuristics* (Rozin & Nemeroff, 2002)

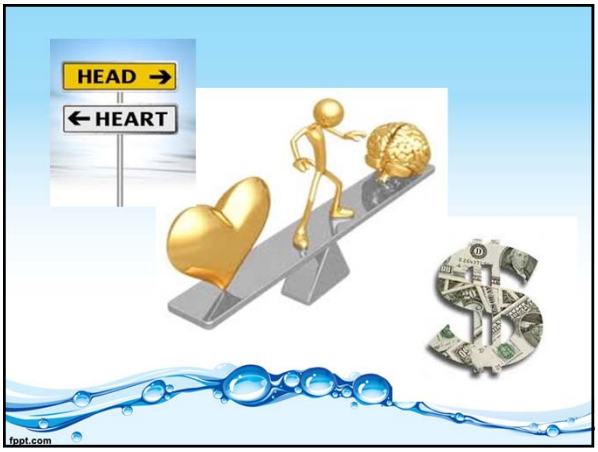
What's so magical about magical contagion?

The Magical Law of Contagion: Once in contact, always in contact

- Much broader, less differentiated than germ theory
  - Transmissable qualities may be
    - Physical, mental/behavioral, or moral (e.g., Hitler's sweater)
    - Negative or positive in valence (e.g., blessing)

25 years of research on magical thinking in daily life:

- Pervasive:
  - grandmother's ring, token hunting
  - Interpersonal domain, food/eating, illness risk perceptions
- Automatic
- Often implicit (unconscious) rather than explicit
- Generates "head versus heart/gut" conflicts
- Can override if motivated enough

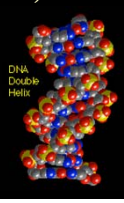


Key features of magical contagion

- Contact is critical
- History of object is *part of* the object
  - Perceptible trace not necessary
- Permanence of effects
- Holographic principle

The holographic principle

- Size doesn't matter
  - All essential features are transmitted, no matter how small the contact/trace (like DNA)
- Dose insensitivity
  - Overconcern with micro-contamination



So why don't we all have Obsessive-Compulsive Disorder?

Framing our world:

- We constantly frame things out of awareness (Tversky & Kahneman, 1981)
- But the right cues can heighten awareness
  - Hurliman & McKay (2006)
    - Color, odor, salt raise concerns
  - Jeffrey & Jefferson (2003)
    - Turbidity

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The Psychology of Water Reclamation and Reuse

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The Team:

- ***Brent Haddad***, Environmental Sciences, University of California Santa Cruz (lead)
- ***Paul Rozin***, Psychology Department, University of Pennsylvania
- ***Paul Slovic,*** Decision Research and Psychology Department, University of Oregon:
- ***Carol Nemeroff***, Portable Ethics, Inc. and Social and Behavioral Sciences, University of Southern Maine.

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The Questions:

- What are basic attitudes to recycled water?
  - Magical contagion basis?
- How can we break the association between the water and its history?
  - Time, distance, naturalness
- Other key factors:
  - How much information is enough/too much?
  - Role of trust/mistrust

Method:

- Administered surveys in 5 U.S. cities:
  - Eugene, OR; Philadelphia, PA; Phoenix, AZ; San Diego and San Jose, CA
  - Participants approached in public places
- N = 2695
  - 51.5% male
  - Average age 37.9 yrs (s.d. 15.5)
  - Average education 14.8 yrs (s.d. 2.8)
  - Few geographic differences in response patterns

"Recycled" water is water that is separated from wastewater and highly treated so it can be used again. It is also called "reclaimed water" and "water reuse." Would you be willing to drink certified safe recycled water? (Yes, Uncertain, No)

- **38% willing**
- **49% uncertain**
- **13% refuse**

What sort of purifications make recycled water acceptable?

- **What is most effective *psychologically* may not be the same as what is most effective *physically***
- Method followed Nemeroff & Rozin, 1994
  - Imagine a series of purifications
  - Rate acceptability of water after each one

- "Now we are going to ask you about your reaction to a set of different kinds of water. In each case, assume you are thirsty and that an 8-oz glass of the water described is available for you to drink. Assume all the waters below, except raw sewage water and boiled sewage water, look and taste the SAME.
- Rate on a scale of 0-10 how willing you are to drink each type of water described (0=totally unwilling/uncomfortable; 10=totally willing/comfortable)?

Two types of item:

- Processes used to purify

- Delivery methods

Processes (boil, skim, filter, etc.)

1. How willing are you to drink sewage water that has been kept still so lighter things **float** to the surface and heavier things **sink** to the bottom, after which all these things are **removed?**
   M = 1.18 (s.d. = 2.25)
2. How willing are you to drink sewage water that is **filtered through soil** to remove remaining living microbes?
   M = 1.97 (s.d. = 2.72)
3. How willing are you to drink sewage water that is passed through **tightly meshed filters** to remove any microbes and unwanted chemicals?
   M = 2.84 (s.d.=3.16)

Processes, continued:

4. How willing are you to drink 1 part sewage water mixed with 1000 parts pure mountain spring water? **(dilution**)
   M = 3.07 (s.d. = 3.49)
5. How willing are you to drink sewage water that has been **boiled** enough to destroy all microbes?
   M = 3.37 (s.d. = 3.33)
6. The combination of the three treatments above in order (waste is [1] skimmed off bottom and top, [2] filtered through soil, and [3] passed through tightly meshed filters to remove any remaining microbes and unwanted chemicals) is called **tertiary treatment**. How willing are you to drink sewage water that has been subjected to tertiary treatment?
   M = 4.05 (s.d.= 3.57)

Processes, continued:

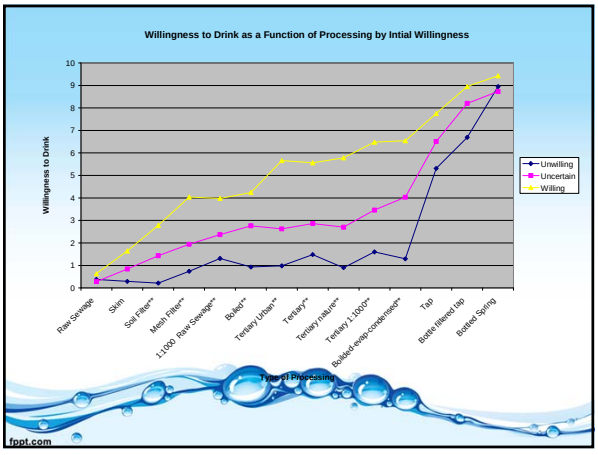
7. How willing are you to drink sewage water subjected to **tertiary treatment in an attractive natural setting** outside town?
   M = 4.12 (s.d. = 3.62)
8. How willing are you to drink sewage water subjected to **tertiary treatment in an urban** water treatment plant?
   M = 4.02 (s.d.= 3.56)
9. How willing are you to drink sewage water that has been boiled enough to destroy all microbes and then is evaporated and then condensed and collected as pure water? (**distilled**)
   M = 5.00 (s.d. = 3.78)

Processes, continued:

10. How willing are you to drink 1 part tertiary treated sewage water mixed with 1000 parts pure mountain spring water? **(tertiary/diluted)**
    M = 4.87 (s.d. = 3.9)

Delivery Methods

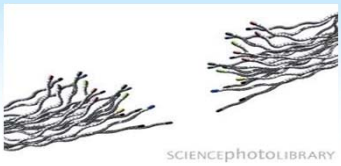
12. How willing are you to drink **tap** water?
    M = 6.98 (s.d. = 3.21)
13. How willing are you to drink **commercial bottled water** (filtered tap water)?
    M = 8.43 (s.d. = 2.61)
14. How willing are you to drink commercial bottled water (from a **spring**)?
    M = 9.15 (s.d. = 2.12)



In other words:

Most people are relatively unimpressed by purification methods, and some are completely nonresponsive to them.

How to break the connection?



Time

- Leaving the water treatment plant, the water is deposited into a lake or reservoir for (1 year or 10 years).
- Leaving the water treatment plant, the water filters through an underground aquifer for (1 year or 10 years)

People prefer:

- Aquifer over lake/reservoir
- 10 years over 1 year
  - But some show opposite effect

Distance

- Leaving the water treatment plant, the water travels (100 miles versus 1 mile) *down a swift river.*

- 100 miles is better than 1 mile
  - little change for "Willing" group
  - .5 point change for "Uncertain" group
  - .8 point change for "Unwilling" group – *one of the only things that made a difference to this group*

The Asian Disease Problem

Tversky & Kahneman, 1981

The Asian Disease Problem

Tversky & Kahneman, 1981

- In a group of 600 people
  - Program A: 200 people will be saved
  - Program B: there is a 1/3 probability that 600 people will be saved, and a 2/3 probability that no people will be saved

72% prefer program A, 28% program B

Versus:

- In a group of 600 people
  - Program C: 400 people will die
  - Program D: there is a 1/3 probability that nobody will die, and a 2/3 probability that 600 people will die

78% prefer program D, 22% program C

- **Odds re how many live and die are identical for A and C, and for B and D.**
- ***But the “framing” of the question shifts people from preference for certainty to preference for gamble***
- *Neither frame is false or misleading*

What should we “frame in” and “frame out” of talking about recycled water?

- "Frame out" history as sewage or wastewater (invokes frame of pollution/contagion/risk)
  - Concept of trigger words from HIV prevention study: "negative blood test" paradoxically *increased* perceptions of risk whereas "negative test" *reduced* them
  - Talking about details of purification methods is likely to produce paradoxical results
- "Frame in" ultra-purity (frame of safety)

TMI? WTMI? WWTMI?

- 35% of participants endorse: "If recycled water is part of my drinking water supply, as long as it is safe, I'd rather not know the details."
- 30% of participants endorse: "Being assured by someone I trust that my water is safe is more important than being given all the facts."

But who is trustworthy? The "source credibility" problem.

Actor/athlete	2.14	Board of engineers/community reps	5.70
Neighbor	3.20	Federal Engineers/Inspectors	5.88
Private Firm	4.11	State Engineers/Inspectors	5.95
Manager of facility	4.62	Qualified University scientist	6.59
Staff of facility	4.67		
Doctor lives nearby	4.68		
Person drinking recycled water for years	5.06		

Yes

Scientists
State
Federal
Local

Trustworthiness

Private Industry
Celebrities

No

*Wait - do people **really** not want to know the details?*

- It depends! Calloway (2011):
  - IF avoid trigger words and negative cues
  - AND focus on purity of water rather than history
  - AND make information user-friendly
  - THEN more in-depth information is better
- Information that is too generic is mistrusted

But wait a minute…..

- If contagion-based thinking is pre-programmed, automatic, and so hard to undo, then why are people so UNconcerned about it in some contexts?
  - E.g., hospital workers have trouble remembering to wash their hands
- **Central role of *familiarity* in risk assessment**

Familiarity and Risk Avoidance

- Dread Risks (Slovic, Fischhoff, & Lichtenstein, 1982) lead to exaggerated risk-avoidance
  - Poorly understood (new, unfamiliar)
  - Evoke feelings of dread
  - Involve large numbers of people
- Conversely, familiar risks are minimized (Slovic & colleagues; Weinstein & colleagues)
  - Crossing the street or driving versus flying

THE GOOD NEWS

- **We can make recycled water familiar!**
  - Talk about it a LOT
  - Package it in familiar "clothing" (plastic?)
  - Include discussion of how long it has been in use, and how well understood, to decrease "dread risk"

Summary:

- Steer clear of cues to concept of "sewage" and "contaminants," to avoid invoking contagion heuristic
- Add cues to purity and naturalness while de-emphasizing cues to technology and history
- Define/delineate the palatable unit: *turn it into new water, not the same water, by introducing discontinuity into the process*

Conclusions:

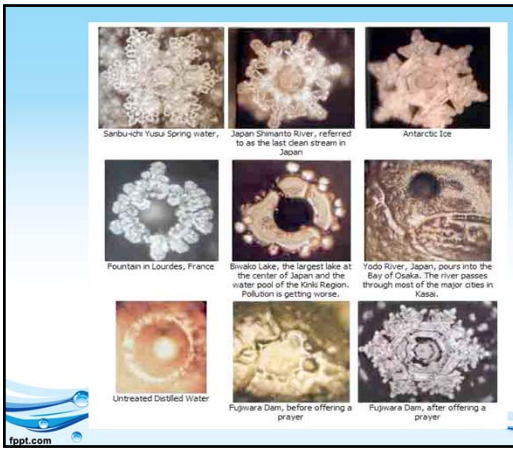
- Problem is one of cognitive heuristics, including intuitive contagion (permanence and dose-insensitivity). These heuristics are automatic and implicit, and not fully subject to logic/science.
- It is more effective to understand and work with and around these heuristics, than to try to override them.

Conclusions, cont.

- DO frame out history
- DO NOT evoke frame of contagion or technology
- DO evoke frame of naturalness and purity
- DO evoke familiarity
- DO focus on building and maintaining trust
- DO NOT provide too much information, e.g. over-focusing on purification process
- DO have info easily available to those who want it (without trigger words)

A prototypical magical contagion-based model of water:

- Masaru Emoto:
  - Structure and level of detail of ice crystals formed by water from different sources
  - Beauty (symmetry and complexity) as indicator of water quality
  - Underlying concept: ***water has memory***



Questions for Future Research?

- Would showing the Unwilling group that recycled water forms beautiful crystals undo their reluctance?
- Would focusing on vibrational aspects of purification be helpful? (E.g., UV light, sound waves, etc.)
- Do people prefer water that has traveled through the natural environment because they believe (maybe unconsciously) it has picked up a memory of "nature?"
- Common phrases in New Age and marketing: living water; Life Water, revitalized water; energized water; charged water, ionized water, vortexed water…

Excerpt from an interview with Dr. Emoto:

- **REIKO:** Once a certain vibration is introduced to the water, how long does the water "remember" that crystalline structure?
- **DR. EMOTO:** This will be different depending on the original structure of the water itself. Tap water will lose its memory quickly. We refer to the crystalline structure of water as "clusters." The smaller the clusters, the longer the water will retain its memory.....A tight bonding structure is best for maintaining the integrity of information.

http://www.enwaterment.com/page/Masaru_Emoto

"Transform Energy with Tachyon Products

Water Crystals, before and after being exposed to a mobile telephone and the microwave.

Water Crystal Photographs by Masaru Emoto published in his book, The Hidden Messages in Water"

(from: http://www.energybalancing.net/pages/products.html

Energized water has had its molecules returned to their original life-giving, super moisturizing state.... a major key to healing, and the maintenance of health and vitality.

Pure, natural, unpolluted spring water is naturally structured water. Since most of us have the mediocre water quality from commercial water producers or municipal services, we need to return tap water to its original, hydrating, life-giving state. Pure, energized, (living, restructured or cluster size reduced) water allows maximum moisture absorption into the cells of our bodies, pets and plants.

http://www.enwaterment.com/page/Water_for_Bathing

- http://www.youtube.com/watch?v=ujQAk9EM3xg&feature=related
- http://www.youtube.com/watch?v=ILSyt_Hhbjg&feature=related
- http://www.youtube.com/watch?v=tAvzsjcBtx8